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EXAMINER

BAUMEISTER, BRADLEY W

ART UNIT PAPER NUMBER

2815

DATE MAILED: 09/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/026,451

Applicant(s)

Akira et al.

Examiner

B. William Baumeister

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on Jul 28, 2003
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above, claim(s) 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some\* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Almogy et al. '590 (previously made of record in IDS #4). See the embodiment of FIG 3 wherein a photodetector 300 is formed above a substrate having a slanted, flat, cleaved side surface for absorbing radiation. The detector is formed in a range in which a perpendicular line to said flat side face crosses.

- a. Applicant argues that "'a cleaved facet' 'lapped to a 45 degree angle' ... means that a cleavage surface is formed and then lapped to a 45 degree angle," and that this is different from the presently claimed "cleaved face." (REMARKS, page 6) This argument is not persuasive. The "cleaved facet" of Almogy is a "cleavage face" as required by the claim. Further, the fact that the cleaved face was subsequently lapped or polished does not change the fact that the face was cleaved--rather it merely means that the cleaved face was subsequently made more smooth.

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b. The Examiner also disagrees with Applicant's asserted interpretation of Almogy that "a cleaved facet is later lapped to a 45 degree angle" means that the face is first cleaved to one given angle that is some angle other than 45 degrees and is then subsequently polished to 45 degrees. Rather, one skilled in the art would understand that the phrase "to a 45 degree angle" references both the cleaving process and the lapping process: i.e., the passage could be restated as, "a facet is cleaved to 45 degrees and later lapped." This is because GaAs-based materials have a cubic, zincblende structure which are commonly grown so as to have a (100) surface, and that such a structure has natural cleave planes of {110} and {111}, both of which are disposed 45 degrees relative to the {100} surface. As such, it would make sense that since Almogy desires to produce a final surface having a 45 degree angle relative to the surface, that the cited passage means to cleave along one of the {110} or {111} planes to roughly approximate the final surface and to then lap or polish this 45-degree surface to fine-tune the layer's smoothness. In contrast, it would make little sense to cleave along different plane (e.g, the (001) , perpendicular to the (100) surface) and then totally change the resultant cleaved face by using the fine-tuning lapping process to change the overall angle of the face (e.g., from 90 degrees to 45 degrees).

c. Moreover, the following case law makes clear that in claims directed towards a product, it is the patentability of the final product *per se* which must be determined, no matter how actually made. Further, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or otherwise. *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also, *In re Brown*, 173 USPQ 685; *In re Luck*, 177

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USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wethheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al.*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964. Note that in such cases, **the burden is on applicant to prove that claim language relating to the method of making the device results in a structural difference over the prior art.**

i. The product-by-process doctrine is relevant to the present situation because whether a cleaved surface is polished is merely a matter of degree of the resultant face's smoothness; the final roughness of a slightly-polished roughly-cleaved surface could still be greater than that of a non-polished, smoothly cleaved surface; and because in the present case, no objective standards are described or claimed which would structurally distinguish a cleaved surface from a surface that is lapped subsequent to being cleaved.

3. Claims 1 and 8-10 are rejected under 35 U.S.C. 102(b) as being anticipated by JP '823 (previously made of record in IDS #3). See e.g., FIG 4c wherein the photodetector comprises an n-InP layer 302; undoped photoabsorption layer 303; n-InP cap layer 304; p diffused region 310 extending into the cap layer and the photoabsorption layer and ohmic electrodes 309/310. The InP substrate is diced all the way through at any desired angle [0018], such as 45 degrees.

a. Applicant asserts that the claims are not anticipated because JP '823 teaches a dicing process, and asserts that "diced" is different from "cleaved." This argument is not persuasive. Regardless of whether some structural distinction may exist between a surface that

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has been “grooved and cleaved” vs. a surface that has been “diced” (cut entirely through with a dicer or cutter), Applicant explains in the present specification that the surface’s cleavage in the present invention is obtained “by operating a cutter (or dicer) on a support face.” (Page 11, line 14). As such, Applicant has defined a cleaved surface to read on a diced surface as well.

***Claim Rejections - 35 USC § 103***

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spaeth et al. ‘223, and further in view of either one of Almogy or JP ‘823 as applied to the claims above.

a. See e.g., Fig 1 wherein a photodetector is formed on the surface of a substrate having a slanted surface 5. The reference also states that anti-reflection coatings may be employed on the slanted side surfaces (col. 2, lines 55-59).

b. Regardless of whether Spaeth sufficiently discloses the specific manner by which the slanted sidewall surface was formed, Almogy teaches that the slanted surface may be produced by cleaving, and JP ‘823 teaches that it may be produced by dicing.

c. It would have been obvious to one of ordinary skill in the art at the time of the invention to have produced the slanted sidewall by either of these methods because they are conventional methods of producing slanted sidewalls for semiconductor substrates. Moreover, it would have been obvious to one of ordinary skill in the art at the time of the invention to have

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included an anti-reflection coating as taught by Spaeth upon the slanted sidewalls taught by either of Almogy and JP '823 for the purpose of increasing light transmission as taught by Spaeth.

6. Claims 1, 4, 6, 8 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Ng, Complete Guide to Semiconductor Devices or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ng, and further in view of either one of Almogy or JP '823 as applied to the claims above.

a. Ng discloses GaAs-based QWIPs wherein the detector is formed on a GaAs substrate that has a 45 degree polished facet (cleavage plane) for receiving incident light and coupling the light to the MQW photoabsorption layer. See e.g., FIG 56.1(a).

b. Applicant argues that a polished facet is not a cleavage plane. The Examiner still maintains that the recitation of "a 45 degree polished facet" is synonymous with "a cleavage plane" or "a cleavage face." Nonetheless, for the sake of compact prosecution and customer service, even assuming *arguendo* that the reference's language does not necessarily teach "a cleavage face" with sufficiently specificity to support an anticipation rejection, the claims would nonetheless have been obvious in view of either one of Almogy or JP '823, because as explained above, these references each teach forming a slanted sidewall so as to have a cleavage face, and it would have been obvious to one of ordinary skill in the art at the time of the invention to have produced the slanted sidewall by either of these methods because they are conventional methods of producing slanted sidewalls.

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c. Regarding claim 6, as explained previously, Ng does not further disclose what specific surface orientation may be employed for the GaAs substrate. Nonetheless, it was well known to those of ordinary skill in the art at the time of the invention that the (100) surface is the most commonly employed orientation for growing device layers on GaAs substrates, so it would have been obvious to have employed the (100) orientation for this reason, as set forth in claim 6.

d. In further regard to claim 4, as Ng teaches that the polished facet sideface of the substrate is angled 45 degrees to the principle surface, it would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the side face on the {110} or {111} planes because these are both natural cleavage planes for GaAs that are angled 45 degrees from the {100} plane.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP '823 as applied to the claims above. The embodiment of FIG 4(c) depicts the substrate being diced at an angle to the principle substrate, but that embodiment does not depict that the opposite sidewall is parallel. The embodiment of FIG 3 depicts the substrate being diced obliquely partially through the surface so that the opposite sidewall is parallel, but is not diced entirely therethrough.

a. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the teachings of the two JP '823 embodiments so as to form the opposing sidewall parallel to the light-receiving sidewall for achieving the simultaneous advantages of (1) simplifying the manufacturing process by enabling a plurality of devices to be



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separated from a single wafer by a single dicing operation; and (2) increasing the wafer's device yield by eliminating the waste of that portion of the substrate that is removed by the v-shaped dicing of the FIG 4(c) embodiment. This would be particularly advantageous for use in those applications wherein an additional reflective coating is placed on the opposing side-wall for preventing light scattering losses as taught by various references of record (e.g., Spaeth et al. '223, FIG 4).

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP '823 as applied to the claims above and further in view of Makiuchi '114. JP '823 discloses that the angle may be freely chosen, but does not set forth what specific range of angles are desirable or achievable. Makiuchi teaches photodetectors wherein the substrate is provided with a sloped side wall region for the purpose of redirecting light entering the substrate towards the photodetector formed thereon. See e.g., Fig 6 wherein the specification discloses that angle theta 2 may range between 45 and 60 degrees. 60 degrees corresponds to the complementary angle as set forth in claim 5 of 30 degrees. It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the sloped sidewall of JP '823 so as to have an angle specifically of 30 degrees as taught by Makiuchi depending only upon conventional considerations such as the specific light-detection application desired, which in turn, dictates the size of the detector/substrate combination and the spacial disposition of the detector thereon relative to the edge of the substrate surface.

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*Response to Arguments*

9. Applicant's arguments filed 7/28/2003 have been fully considered but they are either moot or are not persuasive for the reasons set forth hereinabove.

*Conclusion*

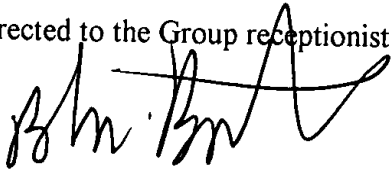
10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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**INFORMATION ON HOW TO CONTACT THE USPTO**

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to the examiner, **B. William Baumeister**, at **(703) 306-9165**. The examiner can normally be reached Monday through Friday, 8:30 a.m. to 5:00 p.m. If the Examiner is not available, the Examiner's supervisor, Mr. Eddie Lee, can be reached at (703) 308-1690. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.

A handwritten signature in black ink, appearing to read 'B. William Baumeister', is written over the text of the paragraph.

B. William Baumeister

Primary Examiner, Art Unit 2815

September 8, 2003